Chapter 2 Why O&M?

2.1 Introduction

Effective O&M is one of the most cost-effective methods for ensuring reliability, safety, and energy efficiency. Inadequate maintenance of energy-using systems is a major cause of energy waste in both the federal government and the private sector. Energy losses from steam, water and air leaks, uninsulated lines, maladjusted or inoperable controls, and other losses from poor maintenance are often considerable. Good maintenance practices can generate substantial energy savings and should be considered a resource. Moreover, improvements to facility maintenance programs can often be accomplished immediately and at a relatively low cost.

2.2 Definitions

Operations and Maintenance are the decisions and actions regarding the control and upkeep of property and equipment. These are inclusive, but not limited to, the following: 1) actions focused on scheduling, procedures, and work/systems control and optimization; and 2) performance of routine, preventive, predictive, scheduled and unscheduled actions aimed at preventing equipment failure or decline with the goal of increasing efficiency, reliability, and safety.

Operational Efficiency represents the life-cycle, cost-effective mix of preventive, predictive, and reliability-centered maintenance technologies, coupled with equipment calibration, tracking, and computerized maintenance management capabilities all targeting reliability, safety, occupant comfort, and system efficiency.

2.3 Motivation

In June 2000, Executive Order 13123 went into effect promoting government-wide energy efficiency and renewable energy, thereby revoking Executive Orders 12902 and 12759, both of which dealt with reducing the government's energy use. The new Executive Order strengthens the government's efforts to pursue energy and cost savings, and raises the energy savings goal to a 35% reduction in energy consumption per square foot in non-exempt federal buildings by the year 2010 compared to a 1985 baseline.

There are multiple goals defined by the Order. The more important goals from the federal buildings perspective are to:

- Reduce energy use intensity (MMBtu/ft^2/year) 30% from the fiscal year (FY) 1985 baseline by FY 2005.
- Reduce energy use intensity 35% from the FY 1985 baseline by FY 2010.
- Increase the use of cost-effective renewable energy and reduce reliance on petroleum-based fuels, and identify and implement all cost-effective water conservation retrofits and operational improvements.

Clearly, these are aggressive targets and many federal facilities have been working hard to achieve them. In many cases, the approach to achieving these goals has focused on capital intensive upgrades of existing equipment and making use of a variety of financing options including Energy Savings Performance Contracts (ESPCs), local utility financing programs, and other third-party financing options.

While effective, some feel that capital upgrades are not always the most cost-effective solution. Indeed, the authors of this guide contend that low-cost/no-cost O&M measures (including activities referred to as retrocommissioning or retuning) should be the **first** energy savings measure considered. O&M measures should be considered prior to the installation of energy conservation measures for the following reasons:

- Typically, O&M measures are low-cost or no-cost in nature.
- Many O&M measures are easily installed by in-house personnel.
- O&M measures can have immediate payback.
- These measures rarely require the design time, bid preparation, evaluation, and response compared to capital projects that can take up to a year to implement.

Is an Energy Savings Performance Contract Being Considered? (Haasl and Sharp 1999)

Some level of retrocommissioning (i.e., O&M best practices) is usually appropriate if you are considering any type of energy savings agreement such as an energy savings performance contract. There are two primary reasons for performing retrocommissioning before obtaining an energy-savings agreement. First, the low-cost energy savings gained from retrocommissioning remains with the building (the owner gets all of the savings) and does not become part of the financial agreement; second, retrocommissioning optimizes the existing equipment so the most appropriate capital measures are selected and financed through the agreement.

A good reason for doing retrocommissioning as part of an energy-savings agreement is to ensure that the performance of new equipment is not hindered because it interfaces with older equipment, components, or systems that are malfunctioning. Even when commissioning is specified for the new equipment, it often stops short of looking at the systems with which the new equipment interfaces or examining how it integrates with other systems or equipment that may affect its performance. This is especially true for energy management control systems. Because controls are an area where many difficulties and misunderstandings occur between building owners and performance contractors, it is a good idea to specify commissioning for both the new and existing equipment that may affect the performance of the new equipment.

When retrocommissioning is performed before the energy-savings agreement or energy savings performance contract is finalized, it is important to inform the contractor about the retrocommissioning activities and give him or her a copy of the final report. If the contractor is not informed and energy bills from prior years are used to help determine the energy baseline, the baseline may be inaccurate. This may cause the cost savings upon which the financing is based to be significantly less than expected, leading to disagreements and even legal battles.

Retrocommissioning performed up front to capture the low-cost savings may not be a wise choice if the savings from the retrocommissioning do not remain with the building but, instead, go into a general fund. In this case, the "low-cost/no-cost" improvements should be part of the performance contract. In this way, a portion of the savings stays with the building as part of the financial arrangement. Integrating the retrocommissioning measures into the energy-savings agreement is a way to capture the savings as part of the investment repayment. The amount invested can be increased when the savings estimates are higher. Moreover, the savings gained from bundling these measures with the capital upgrades – especially if some of the upgrades are marginally cost-effective (i.e., good value but with long paybacks) – help to increase the overall viability and attractiveness of the energy savings performance contract funding.

2.4 O&M Potential, Energy Savings, and Beyond

It has been estimated that O&M programs targeting energy efficiency can save 5% to 20% on energy bills without a significant capital investment (PECI 1999). From small to large sites, these savings can represent thousands to hundreds-of-thousands of dollars each year, and many can be achieved with minimal cash outlays.

Beyond the potential for significant cost and energy/resource savings, an O&M program operating at its peak *operational efficiency* has other important implications:

A demonstration focused on O&M-based energy efficiency was conducted at the U.S. Department of Energy Forrestal Building in Washington, D.C. (Claridge and Haberl 1994). A significant component to this demonstration was metering and the tracking of steam use in the building. Within several months, $250,000 per year in steam leaks were found and corrected. These included leaks in a steam converter and steam traps. Because the building was not metered for steam and there was not a proactive O&M program, these leaks were not detected earlier, nor would they have been detected without the demonstration. The key lessons learned from this case study were:

- O&M opportunities in large buildings do not have to involve complex engineering analysis.
- Many O&M opportunities exist because building operators may not have proper information to assess day-to-day actions.
- Involvement and commitment by building administrators is a key ingredient for a successful O&M program.

- A well-functioning O&M program is a safe O&M program. Equipment is maintained properly mitigating any potential hazard arising from deferred maintenance.
- In most federal buildings, the O&M staff are responsible for not only the comfort, but also the health and safety of the occupants. Of increasing productivity (and legal) concern are indoor air quality (IAQ) issues within these buildings. Proper O&M reduces the risks associated with the development of dangerous and costly IAQ situations.
- Properly performed O&M ensures that the design life expectancy of equipment will be achieved, and in some cases exceeded. Conversely, the costs associated with early equipment failure are usually not budgeted for and often come at the expense of other planned O&M activities.

When Marion County, Florida, officials realized their new county courthouse was making hundreds of employees sick, they did more than send the workers to the doctor, they sued the builder/operator of the building for bad air and won a $14.2 million judgment (Ewell 1996).

- An effective O&M program more easily complies with federal legislation such as the *Clean Air Act* and the *Clean Water Act*.
- A well functioning O&M program is not always answering complaints, rather, it is proactive in its response and corrects situations before they become problems. This model minimizes callbacks and keeps occupants satisfied while allowing more time for scheduled maintenance.

2.5 References

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